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Remarks

The Examiner has rejected Claims 1-26, as being indefinite.

The Examiner has rejected Claims 1-8 and 19-23 of the present application under 35USC103(a) as being unpatentable over Hause (US 6090694) in view of Meador (US 5919599) and Hyakutake (US 6087250). Claims 9-11 have been rejected under 35 USC 103(a) as being unpatentable over Hause in view of Meador and Hyakutake as applied to claim 1, and further in view of Puligadda (US 6,323,310). Claim 12 is under 35 USC 103(a) as being unpatentable over Hause in view of Meador and Hyakutake as applied to claim 1, and further in view of Diachlara (US 5482817). Claim 14 have been rejected under 35 USC 103(a) as being unpatentable over Hause in view of Meador and Hyakutake as applied to claim 1, and further in view of Samuels (US 6268907). Claim 15-18 have been rejected under 35 USC 103(a) as being unpatentable over Hause in view of Meador and Hyakutake as applied to claim 1, and further in view of Brown (US 5882967). Claims 24 and 26 have been rejected under 35 USC 103(a) as being unpatentable over Hause in view of Meador and Hyakutake as applied to claim 1, and further in view of Malik (US 6312870). Claim 25 have been rejected under 35 USC 103(a) as being unpatentable over Hause in view of Meador and Hyakutake as applied to claim 1, and further in view of Yoon (US 6,537,727). The Examiner has not given any basis for rejecting claim 13.

The solid content in claim 1 refers to weight%.

The Examiner has requested a lower limit on the solid content of the BARC and a minimum film thickness of the BARC. The solid content and the film thickness are related in that both these parameters are dependent on the molecular weight of the polymer, absorbance of the antireflective coating, the viscosity of the polymer, physical parameters of the solvent, and many other physical parameters. Thus, the minimum film thickness of the BARC is greater than 0 nm. The lower limit is not 0, since then there would be no antireflective coating beneath the photoresist. Similarly, the solid content of the antireflective coating is greater than 0 weight%.

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Claim 1 has been amended to cover an aqueous alkaline developer useful for developing the photoresist and the antireflective coating in a single step, and also covers a minimum film thickness of the antireflective coating of greater than 0.

The present invention, and claim 1, discloses a bottom antireflective coating which is radiation sensitive. A radiation sensitive antireflective coating (ARC) is unique in that it comprises a polymer which interacts with a photogenerated acid such that the bottom antireflective coating is developable in the same step (step (d)) as the photoresist. Both the antireflective coating and the photoresist are developable in an aqueous alkaline developer. Since the bottom antireflective coating absorbs radiation and is developable, the coating is susceptible to interference of standing waves from the imaging radiation and these waves are reflected from the substrate. If a node (destructive interference so that no light is present) of the standing wave is present at the substrate and antireflective coating interface, then the bottom antireflective coating will not develop. This development restriction is not present for an inorganic antireflective coatings or thermosetting organic antireflective coatings, which are both removed physically by gaseous dry etching and not chemically developed. Thus, the set of parameters that are used to define the alkali developable bottom antireflective coating are quite different from a dry etchable bottom antireflective coating, the film thickness being one of the most critical parameters.

Neither Hause, Meador nor Hyakutake disclose a radiation sensitive photoimageable bottom antireflective coating, which is chemically developed along with the photoresist in a single step (step (d) of the present application) using an aqueous alkaline developer. Claim 1 of the present application clearly recites that "both are developed in step (d) using a single developer".

In rejecting the present application, the Examiner has cited Hause, Column 2, lines 7-16, where Hause in the Background Section expresses that the pattern be developed in both the photoresist and the ARC. Subsequently, Hause outlines the need that "Two other requirements are that the ARC must

have a refractive index that matches the photoresist, and that the ARC must develop and be stripped with the same chemicals as the resist." Hause clearly expresses a requirement that the same chemicals be used for the resist and ARC, but does not require that the resist and the ARC be removed in the same step, and at no point teaches how this may be achieved. Based on Hause, there is no motivation or teaching to combine the development of the resist and the development of the ARC in a single step, and furthermore, one of ordinary skill in the art would not know from Hause, the chemical and physical properties necessary for a photoresist or an antireflective coating to achieve this objective.

In addition, the Examiner also refers to Hause, column 4, lines 1-27, as teaching the process of developing the photoresist and antireflective coating in the same developer and in the same developing step. Hause does not clearly disclose the development of the photoresist and the antireflective coating in a single step, particularly using an aqueous alkali developer. Column 4, lines 23-24, "The exposed portion can be removed by developing the photoresist.", where Hause teaches the step where only the photoresist is developed. One can only learn from this that first the photoresist is developed and then the photoresist image is transferred to the ARC, wherein Hause is completely silent as to how the transference of the photoresist image to the ARC may be accomplished. Column 5, lines 14-19, "Now, with a single processing step such as liquid or dry etch, the portions 141 and 142 of the etch stop layer 140, as well as the ARC layer 340 made of a similar material to the etch step can be removed substantially simultaneously in a single processing step."; again, the antireflective coating is removed in a different step to the photoresist. Although Hause prefers that the photoresist and ARC be developed, it does not teach the composition of the ARC or how to remove the ARC, or that both layers must be developed by an aqueous alkali developer in the same step. The art at that time as shown in Meador and Hyakutake, as stated by the Examiner, both disclose an ARC that is dry etched. Thus, clearly, Hause discloses a very different type of processing

teps compared to the present application. Since the teaching of Hause is so different from the presently claimed invention, it is requested that Hause be removed as a prior art reference.

Meador discloses a "thermosetting polyacrylate anti-reflective coating composition" column 7, lines 59-60. This antireflective coating is removed in a separate step from the photoresist, in fact, it is plasma etched and not developed in the same developer as the photoresist, column 8, lines 10-13, "The resist pattern is then transferred into the anti-reflective coating layer by reactive ion etching .... using various gases or gas mixtures" . Thus, Meador's antireflective coating is not sensitive to radiation and therefore is not susceptible to standing waves and nodes in the same way as a developable antireflective coating, and has totally different optimization parameters compared to a radiation sensitive antireflective coating. The process of Meador comprises separate steps for developing the photoresist, and then dry etching the antireflective coating, and thus is distinctly different from that claimed by the present invention. Furthermore, an aqueous alkali developer is not used to develop the antireflective coating.

Hyakutake teaches only inorganic antireflective coatings and discloses a method of manufacturing a device, where the antireflective coating is TiN, and therefore cannot be developed at the same time as a photoresist, and, moreover, requires gaseous dry etching. In column 3, lines 12-13, "On Al alloy layer 505, an antireflection film 506, such as TiN is formed". Inorganic films have to be dry etched and have very different optimization methodology as compared to alkali developable photoimageable antireflective coatings.

Based on the arguments presented above the Examiner is requested to remove Hause, Meador and Hyakutake as prior art references against the present application, since they all disclose a process different from the present invention. Furthermore, the Examiner is using the present invention to reconstruct the claimed invention out of several isolated teachings in the prior art.

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Since the Applicant's believe that Hause, Meador and Hyakutake are not valid prior art references, then the Examiner's rejection on the remaining claims based on Puligadda, Dichiara, Samuels, Brown, Malik, and Yoon should also be withdrawn.

In view of the above amendments and remarks, the present application is believed to be in condition for allowance, and reconsideration of it is requested. If the Examiner disagrees, she is requested to contact the agent for Applicants at the telephone number provided below.

Respectfully submitted,

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